As noted earlier, the direct impact of SFAS 106 on labor costs in sector 2 was taken to be +3%. The corresponding impact on TELCO labor costs is +6.3% and the baseline value of 3% is derived using the Adjustment factors in Section II as

$$
\begin{aligned}
& 6.3 \times (3) \times (4) \times (5) \times (6) \times (8) \\
= \; & 6.3 \times .5850 \times .5438 \times .9287 \times 1.313 \times 1.3062 \\
= \; & \underline{3.18}
\end{aligned}
$$

There is thus an appropriate consistency in the baseline value used for this parameter. Nonetheless we will show the results of varying this value over a wide range (from 2% to 5%) while keeping the TELCO value constant at 6.3%.

Finally we will examine the sensitivity of our results to variations in the value used for labor supply elasticity. We believe, by setting the labor supply elasticity equal to zero rather than slightly negative, that already we have guarded against understating the impact on the GNP-PI. Nonetheless we will show the effect of using positive values of 0.1, 0.2, and 0.3 for the labor supply elasticity.

The table that follows shows the results obtained by changing each of the 6 baseline parameters, one at a time. In each of the rows of the table, the values of 5 of the 6 inputs to the model are the same as in the baseline calculation listed above. The input shown in the table is the one input that is changed from the baseline calculation.

Sensitivity Analysis

	Effect on GNP Price Index	Passthrough Coefficient
Price elasticity of demand = 3	0.0227%	0.041
Labor share in total cost, sector 1 = 0.50	0.0099%	0.021
Labor share in total cost, sector 1 = 0.78	0.0145%	0.023
Labor share in total cost, sector 2 = 0.50	0.0103%	0.020
Labor share in total cost, sector 2 = 0.78	0.0141%	0.024
Fraction of labor employed in sector 2 = 0.24	0.0104%	0.025
Fraction of labor employed in sector 2 = 0.40	0.0137%	0.020
Direct impact on labor costs in sector 2 = +2%	0.0056%	0.015
Direct impact on labor costs in sector 2 = +5%	0.0336%	0.037
Labor supply elasticity = 0.1	0.0642%	0.117
Labor supply elasticity = 0.2	0.1136%	0.205
Labor supply elasticity = 0.3	0.1579%	0.287

The Overall Results

We have concluded that the overall impact of SFAS 106 on the GNP-PI will reflect only 0.7% of the SFAS 106 costs incurred by TELCO. Separately we have calculated that if TELCO were able to benefit from the same relative reduction in its wage rate as will be experienced in the economy as a whole this would finance a further 14.5% of its additional SFAS 106 costs. This would leave 84.8% of TELCO's additional SFAS 106 costs to be met from other sources. We now show the sensitivity of the overall results to the interaction of the variability of the BLI Methodology and the variability of the inputs to the Macroeconomic Model.

The baseline inputs to the model include the assumption that the direct impact of SFAS 106 on labor costs in sector 2 is +3%. We have shown the effect on the model of reducing this figure to +2% or increasing it to +5% with other inputs remaining unchanged. The value of 3% (more precisely 3.18%) corresponds to a SFAS 106 Cost Increase Ratio of 28.3% (page 9). The values of 2% and 5% correspond to Cost Increase Ratios of 17.8% and 44.5% respectively: we believe this range adequately encompasses the likely variations in this ratio. To demonstrate the interactive effect of possible variability we have produced three sets of results, one for each of the values 2%, 3% and 5%. The following schedule shows for each of these values the results if each of the other inputs is set at the baseline values followed by the results if each of the other inputs is varied alone as indicated.

PERCENTAGE OF TELCO'S ADDITIONAL SFAS 106 COSTS:

(a) reflected in the GNP-PI,
(b) financed by potential reduction in relative wage rate and
(c) to be met from other sources

If Additional SFAS 106 cost of Average Employer With SFAS 106 Liabilities is

Input to Macroeconomic Model (All Baseline except as indicated)	2%			3%			5%		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
Baseline	0.3	9.9	89.8	0.7	14.5	84.8	1.9	23.4	74.7
Price elasticity of demand = 3	0.6	9.6	89.8	1.3	14.1	84.6	3.4	22.3	74.3
Labor share in total cost, sector 1 = 0.50	0.2	9.5	90.3	0.6	13.9	85.5	1.5	22.6	75.9
Labor share in total cost, sector 1 = 0.78	0.4	11.4	88.2	0.8	16.8	82.4	2.2	27.2	70.6
Labor share in total cost, sector 2 = 0.50	0.3	10.4	89.3	0.6	15.5	83.9	1.6	25.0	73.4
Labor share in total cost, sector 2 = 0.78	0.4	8.6	91.0	0.8	12.8	86.4	2.1	20.6	77.3
Fraction of labor employed in sector 2 = 0.24	0.3	7.3	92.4	0.6	10.9	88.5	1.6	17.5	80.9
Fraction of labor employed in sector 2 = 0.40	0.3	12.4	87.3	0.8	18.2	81.0	2.1	29.4	68.5
Labor supply elasticity = 0.1	2.2	8.4	89.4	3.6	12.3	84.1	6.6	19.9	73.5
Labor supply elasticity = 0.2	4.0	7.1	88.9	6.2	10.4	83.4	11.0	16.6	72.4
Labor supply elasticity = 0.3	5.7	5.8	88.5	8.8	8.4	82.8	15.1	13.6	71.3

Other Factors

In performing this analysis there were two factors that simply could not be quantified due to lack of any relevant data. First of all as can be seen from Appendix A, our data base from which the GNP BLI was calculated included almost no employees working for employers with fewer than 500 employees. We believe that this tends to overstate the GNP BLI, because such limited data as exists suggests that the smaller the employer the less generous the benefits, but we cannot make a definitive statement to that effect. Secondly our analysis only incorporated the impact of SFAS 106 with respect to employer sponsored post-retirement medical plans. SFAS 106 also applies to Life and Dental plans as well as certain other miscellaneous benefits (e.g., subsidized telephone rates for retirees). As noted, there is simply no accessible data on the prevalence and magnitude of these plans in the GNP. We can, however, make two relevant observations:

- In general, post-retirement medical plans generate far greater SFAS 106 cost than post-retirement life, dental and other plans.

- If an employer does not sponsor a post-retirement medical plan it is almost certain that it does not provide any other post-retirement benefit coverage (other than pension).

Based on the above and the fact that only 26.8% of employees nationally will get post-retirement medical benefits subject to SFAS 106, we conclude that the inclusion of Life, Dental, and other non-pension benefits in the analysis had such data been available would not have had a material impact on the results.

Conclusion

Remembering that at each stage of our calculation process we have sought, when faced with a choice, to adopt a conservative stance and reviewing the results of this sensitivity analysis, we feel confident that our conclusions represent a reasonably accurate reflection of what is likely to happen in practice.

V. APPENDIX A - SUMMARY OF DATA

The tables, charts, and graphs on the following pages summarize the data utilized in this analysis. Included are the following:

- Summary of Godwins Company Data Base.
- Summary of BLI calculations.
- Comparison of TELCO and the GNP with respect to Demographic, Economic, and Actuarial factors.
- Summary of GAO findings on National Prevalence of Post-Retirement Medical Plans.

UNITED STATES TELEPHONE ASSOCIATION

POST-RETIREMENT HEALTH CARE STUDY

SUMMARY OF GODWINS DATA BASE

I. **Companies with Post-Retirement Medical Plan:**

Active Lives:	1 - 24		25 - 99		100 - 499		500 +		Total	
	# COS	# EES	# COS	# EES	# COS	# EES	# COS	# EES	# COS	# EES
Mining & Manuf.	0	0	2	135	13	5,095	431	11,124,456	446	11,129,686
Construction	0	0	0	0	0	0	6	94,893	6	94,893
Transportation	0	0	0	0	0	0	78	1,472,589	78	1,472,589
Retail	0	0	0	0	1	185	30	1,883,869	31	1,884,054
Finance/Insur.	0	0	2	115	13	4,078	207	3,545,526	222	3,549,719
Consumer Serv.	0	0	1	50	3	1,002	43	779,350	47	780,402
TOTAL	0	0	5	300	30	10,360	795	18,900,683	830	18,911,343

II. **Companies with No Post-Retirement Medical Plan:**

Active Lives:	1 - 24		25 - 99		100 - 499		500 +		Total	
	# COS	# EES	# COS	# EES	# COS	# EES	# COS	# EES	# COS	# EES
Mining & Manuf.	6	63	11	614	22	5,287	86	893,483	125	899,447
Construction	1	9	0	0	1	160	5	23,153	7	23,322
Transportation	1	19	0	0	5	1,065	13	77,332	19	78,416
Retail	0	0	0	0	3	760	15	453,510	18	454,270
Finance/Insur.	0	0	2	65	3	740	28	168,205	33	169,010
Consumer Serv.	3	36	1	30	6	1,395	29	484,552	39	486,013
TOTAL	11	127	14	709	40	9,407	176	2,100,235	241	2,110,478

UNITED STATES TELEPHONE ASSOCIATION

Post-Retirement Health Care Study
Summary of BLIs
Based on Godwins' Database

Average BLI Weighted by Number of Employees

Industry	Pre Age 65	Post Age 65	No. of Companies	No. of Employees
Agriculture, Mining, Manufacture & Wholesale Trade	0.7232	0.2340	446	11,129,686
Construction	0.7758	0.0604	6	94,893
Transportation & Utilities	0.7974	0.2643	78	1,472,589
Retail Trade	0.4730	0.0603	31	1,884,054
Finance & Insurance	0.6721	0.1926	222	3,549,719
Consumer Services	0.5771	0.1267	47	780,402
TOTAL	0.6887	0.2060	830	18,911,343

Company Size	Pre Age 65	Post Age 65	No. of Companies	No. of Employees
1-24 Employees			0	0
25-99 Employees	0.4850	0.1476	5	300
100-499 Employees	0.6482	0.1787	30	10,360
500+ Employees	0.6887	0.2060	795	18,900,683
TOTAL	0.6887	0.2060	830	18,911,343

UNITED STATES TELEPHONE ASSOCIATION

Post-Retirement Health Care Study
Comparison of TELCO Demographic and Economic Structures
and Actuarial Basis to National Averages

Demographic

	TELCO	Employers in GNP
Total Active Employees	613,193	114,400,000[1]
Active Employees covered by Retiree Medical Plans subject to SFAS 106	613,193	30,700,000[1]
Retirees covered by Medical Plans	294,482	5,300,000[1]
Average Age of Actives	41.6	38.2[2]
Average Service of Actives	16.6	8.5[3]

Economic

Compensation Per Employee	$38,533	$29,500[4]
Average Claim per Retiree	$3,075	$1,802[5]
Labor Cost as a % of Value Added	38.5%[6]	64.3%[4]
Value Added as a % of Output	74.3%[6]	100%
Accumulated VEBA assets	$1,258.8 million	N/A
Annual VEBA contributions in excess of claims	300.3 million	N/A

Actuarial

Pre-Retirement Turnover	T-2[7]	T-6[8]
Retirement Age	Table[7]	63[9]
1991 SFAS 106 expense	$2,693.1 million	N/A

1. Source - U.S. General Accounting Office
2. Source - U.S. Dept. of Labor, Bureau of Labor Statistics
3. Source - U.S. Bureau of the Cenus Current Population Reports
4. Source - U.S. Dept. of Commerce, Bureau of Economic Analysis Survey of Current Business
5. Source - 1990 Hewitt Associates Survey of Retiree Medical Benefits brought forward to 1991 with 19% trend
6. Source - 1990 ARMIS 43-02's for Price Cap LECs
7. See tables on page 48 for more detail
8. Source - Midpoint of Standard Tables used in generally accepted Actuarial Practice
   Source - The Gerontologist Vol. 28 No. 4

UNITED STATES TELEPHONE ASSOCIATION

Post-Retirement Health Care Study

TELCO Retirement Rates

Age	Rate of Retirement
55-61	9.54%
62	25.00%
63	10.00%
64	10.00%
65	67.00%
66-69	10.00%
70	100.00%

Comparison of TELCO Turnover Rates vs. "Standard" Rates

Probability of Remaining in Service Until Age 55

Table	T-1	TELCO T-2	GNP T-6	T-11
Current Age				
30	.743	.505	.250	.013
35	.873	.650	.363	.047
40	.958	.811	.510	.141
45	.995	.935	.687	.344
50	1.000	.992	.871	.664

Notes

1. Standard Tables in use range from T-1 (most conservative) through T-11 (least conservative). T-6 represents mid-point of range.

2. TELCO utilizes customized assumption most closely approximated by T-2.

3. Supporting evidence for low incidence of turnover at TELCO relative to national average can be seen by the higher average age and past service of TELCO employees relative to average age and service of national working population.

UNITED STATES TELEPHONE ASSOCIATION

Post-Retirement Health Care Study
Summary of Data on National Prevalence of
Post-Retirement Medical Benefit Plans
(Source = United States General Accounting Office)

Covered Employees* by Industry

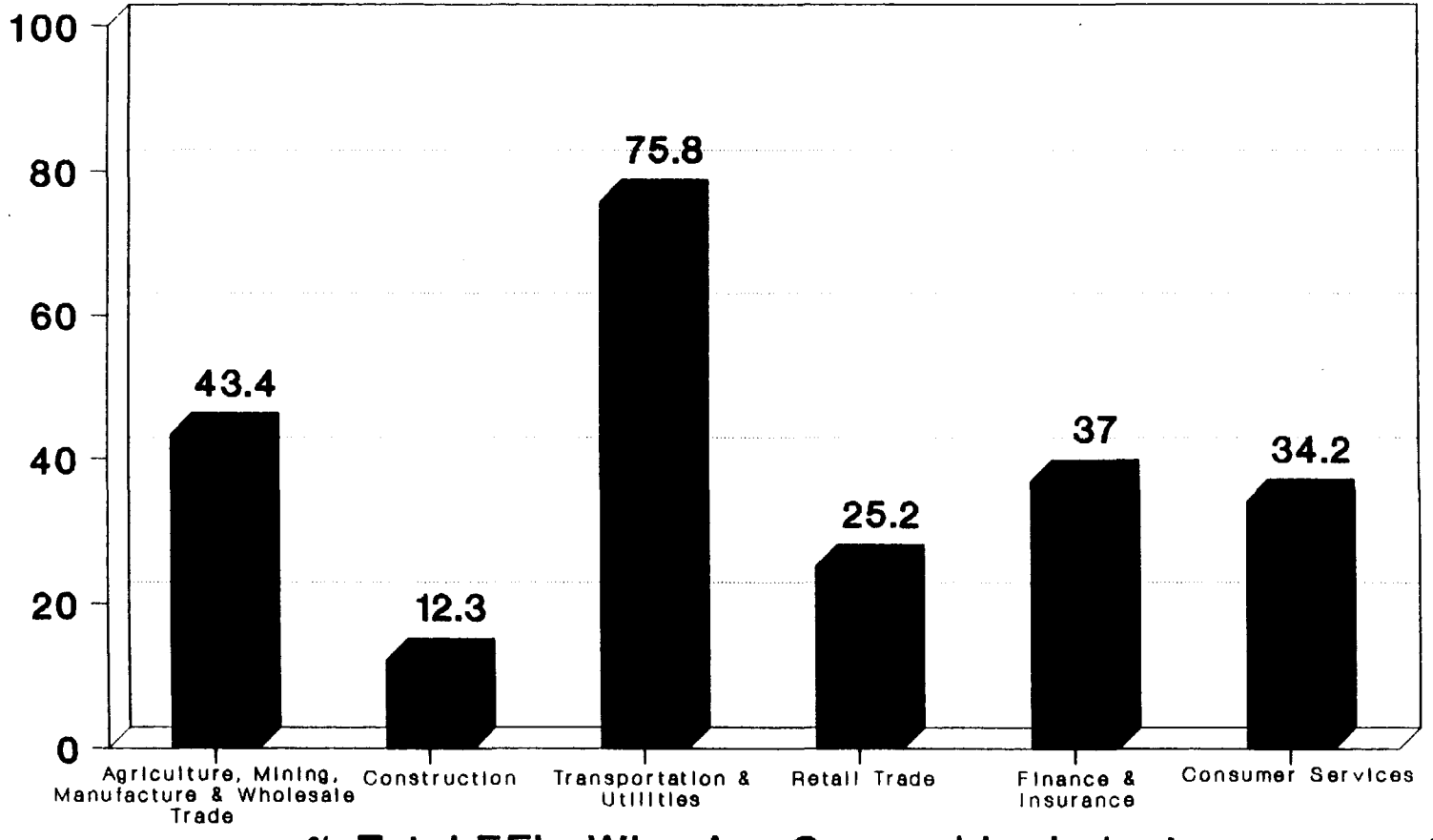
Industry	Total Employees	Covered Employees	% Total Employees Who Are Covered	% of Covered Employees in Industry
Agriculture, Mining, Manufacture & Wholesale Trade	26,729,660	11,602,872	43.4%	30.17%
Construction	4,592,367	562,891	12.3%	1.46%
Transportation & Utilities	11,674,827	8,853,209	75.8%	23.02%
Retail Trade	15,717,209	3,962,734	25.2%	10.31%
Finance & Insurance	28,210,193	10,431,800	37.0%	27.13%
Consumer Services	8,895,653	3,040,556	34.2%	7.91%
TOTAL	95,819,909	38,454,062	40.1%	100.00%

Covered Employees* by Company Size

Company Size	Total Employees	Covered Employees	% Total Employees Who Are Covered	% of Covered Employees by Company Size
1-24 Employees	13,384,195	556,209	4.2%	1.45%
25-99 Employees	12,713,231	1,663,938	13.1%	4.33%
100-499 Employees	19,631,184	3,847,903	19.6%	10.00%
500+ Employees	50,091,299	32,386,012	64.7%	84.22%
TOTAL	95,819,909	38,454,062	40.1%	100.00%

*Covered Employees means employees who work for companies which sponsor post-retirement medical plans. The GAO estimates that only 30.7 million of the 38.5 million covered employees actually could potentially qualify to receive coverage from company sponsored plans. The remaining 7.8 million employees represent those working for non-covered groups within the company (e.g. a subsidiary hich does not participate in the company's plan) or employees who are covered by multi-employer plans which are not subject to SFAS 106.

United States Telephone Association
Post-Retirement Health Care Study
Summary of Data on National Prevalence of Post-Retirement Medical Benefit Plans

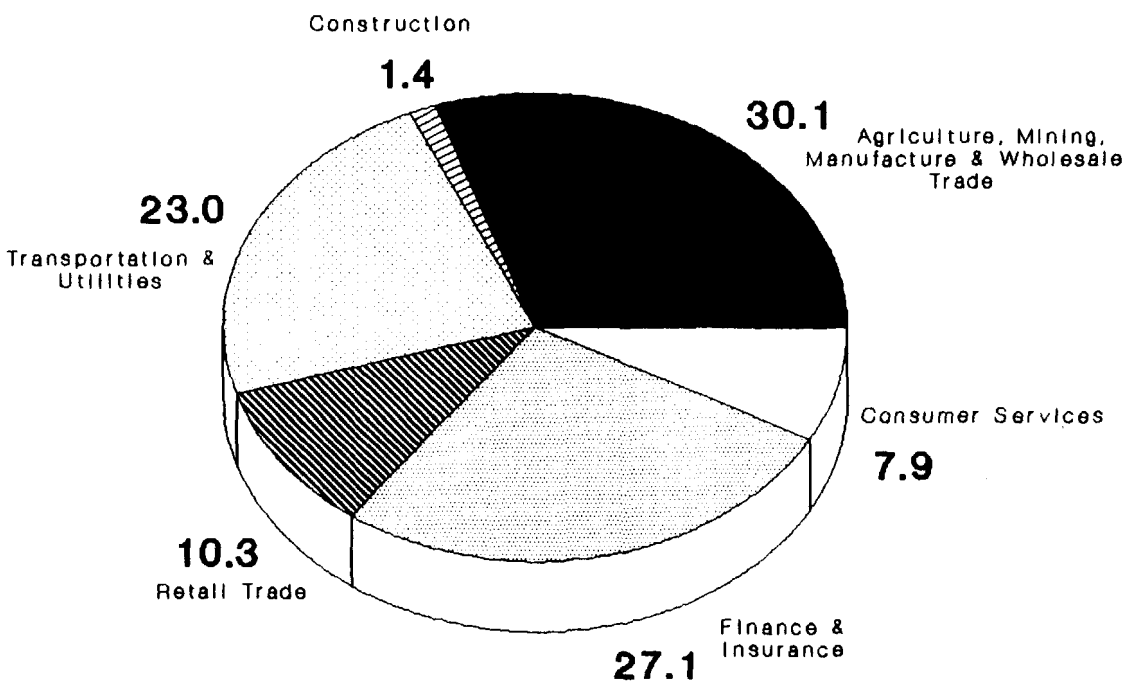


% Total EE's Who Are Covered by Industry

(Source = United States General Accounting Office)

Godwins

United States Telephone Association
Post-Retirement Health Care Study
Summary of Data on National Prevalence of Post-Retirement Medical Benefit Plans

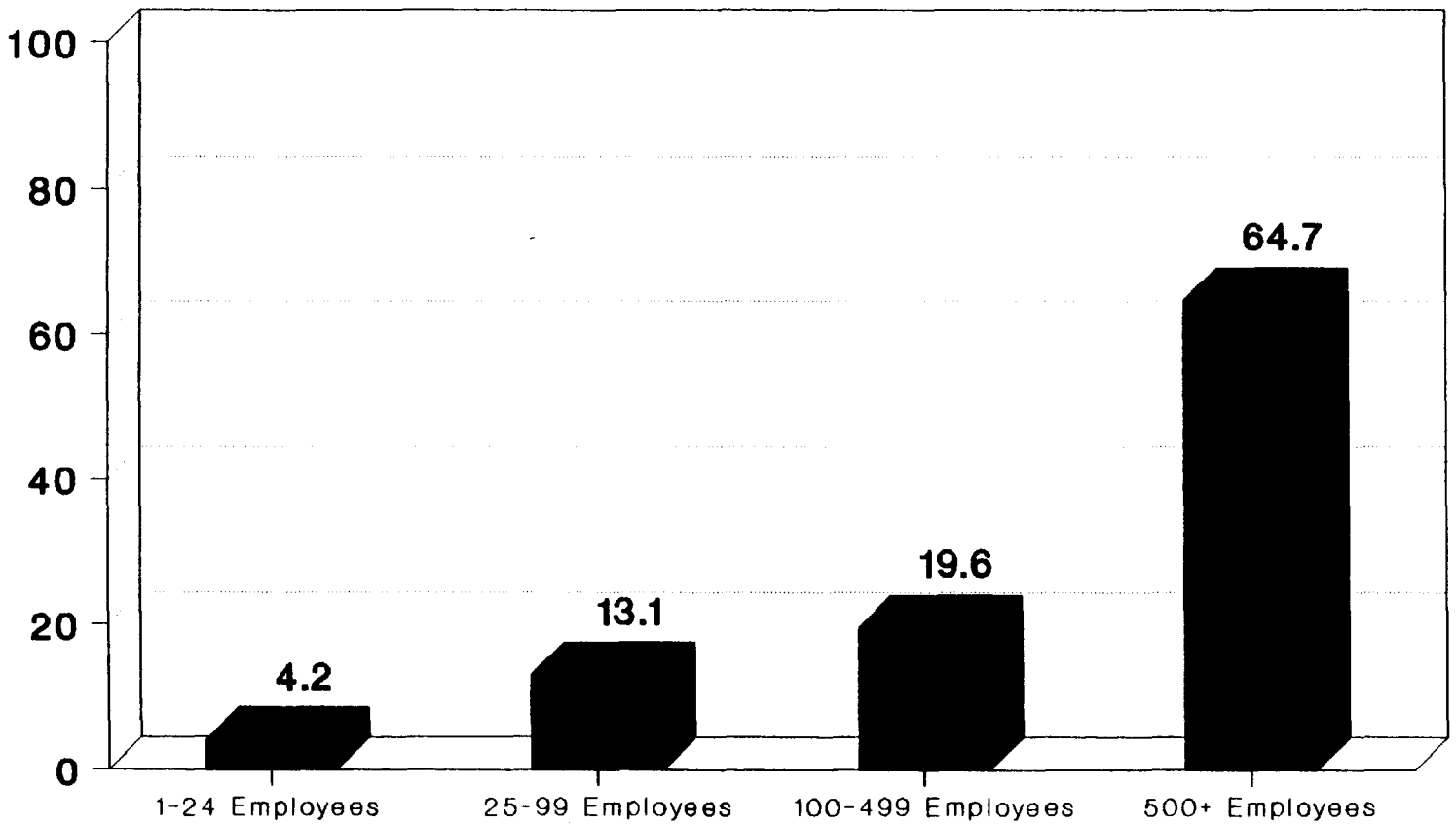


% of Covered Employees by Industry

(Source = United States General Accounting Office)

Godwins

United States Telephone Association
Post-Retirement Health Care Study
Summary of Data on National Prevalence of Post-Retirement Medical Benefit Plans

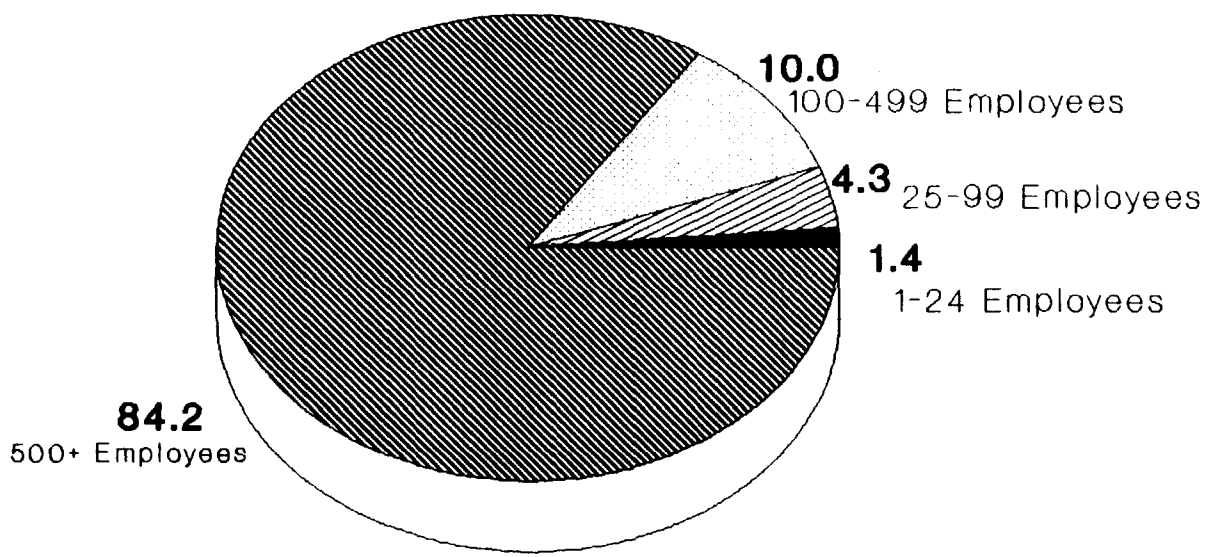


% Total EE's Covered by Company Size

(Source = United States General Accounting Office)

Godwins

United States Telephone Association
Post-Retirement Health Care Study
Summary of Data on National Prevalence of Post-Retirement Medical Benefit Plans



% of Covered Employees by Company Size

(Source = United States General Accounting Office)

Godwins

APPENDIX B - METHODS AND ASSUMPTIONS

Below is a description of the key methods and assumptions used for the derivation of the Demographic Adjustment as well as the basic BLI calculations. The methods and assumptions utilized in developing the other Adjustments are sufficiently documented in Section III.

Demographic Adjustment

The three adjustments making up the Demographic Adjustment were developed by calculating and comparing SFAS 106 costs for sample populations incorporating the GNP and TELCO demographic characteristics based on the age and service distribution of GNP and TELCO employees respectively. The calculations utilized pre- and post-65 per capita claim amounts that bear the same relationships to each other as do the pre- and post-65 BLIs for GNP and TELCO. All assumptions other than withdrawal, and retirement age (already discussed) were as follows:

discount rate - 8.13%

trend rate - 10.08% in 1991 decreasing gradually to 5.56% for the year 2006 and later

retirement eligibility - 55

amortization period for transition obligation - 20 years

percent married - 65%

BLI Calculations

The calculation of individual plan Benefit Level Indicators used the following data and methods.

A data base of annual claim amount distributions was used, based on the experience of 39,436 retirees who participate in employer sponsored post-retirement medical programs administered by a large national insurance company. For pre- and post-65 claimants, frequency weights, monetary weights, hospital/

drug/other ratios and Medicare reimbursements by type were developed. This data base has 35 claim ranges with average claim amounts in each range from $15 to $48,753.

The calculations also used our data base of the post-retirement medical plan provisions for 830 private sector employers. For both comprehensive and base plus plans the following data items were available;

- hospital room and board, either as days covered or a percentage
- surgical coverage
- in-patient physician coverage
- out-patient physician coverage
- diagnostic coverage
- prescription drug coverage, either percentage or flat dollar co-pay
- major medical deductibles
- major medical co-pay percentage
- out-of-pocket maximums
- annual/lifetime maximums
- Medicare integration method (i.e., carve-out, supplement or coordination of benefits)
- participant and dependent contribution rates

These provisions are available separately for pre- and post-65 claimants.

A particular plan's gross BLI was computed by determining how much the plan would reimburse at each claim amount in the distribution data base. The reimbursement amount was determined separately for each type of charge; e.g., hospital, drug, etc. Medicare reimbursement was taken into account explicitly for each type of charge based on the form of Medicare integration in the plan. Each reimbursement was then divided by the corresponding claim to obtain a reimbursement ratio. These ratios were then weighted by the claim amount weights in the distribution to determine the gross BLI.

Per retiree contribution rates were then compared to per retiree claim amounts, and that ratio was used as an offset to the gross BLI to determine the final net pre- and post-65 BLIs for each company in the data base.

After average pre- and post-65 BLIs had been determined for GNP and TELCO (see Section III page 11 for methodology), pre- and post-65 weightings were calculated as the percentages of total SFAS 106 cost associated with pre- and post-65 claims, determined using the same methodology as for the Demographic Adjustment. These were then applied to the pre- and post-65 BLIs to develop GNP BLI and TELCO BLI.

By way of illustration, suppose a comprehensive plan pays 80% after a $200 deductible, subject to an out-of-pocket maximum of $1,500. After 65, Medicare integration is 'Supplement'. Participants contribute $10 per month.

In the $4,000 - $5,000 claim range, for example, we find the average claim to be $4,479. Since this is a comprehensive plan, we derive the pre-65 reimbursement utilizing the total claim amount, that is (4,479 - 200) times 80%, or $3,423. The out-of-pocket maximum has not been met. Therefore, the pre-65 reimbursement ratio in the charge range is 0.7642. The ratios for all ranges are averaged using weights given by the distribution table to determine the gross pre-65 BLI.

The post-65 reimbursement recognizes Medicare integration, in this example the method is Medicare Supplement. We determine the breakdown of charges to be $1,776 for hospital, $567 for prescription drugs, and $2,136 for all other charges. Total Medicare reimbursement is $2,047 (calculated explicitly from

Medicare provisions) and is immediately taken out; in this case $1,177 from hospital, $870 from other medical charges and nothing from drug charges. The plan provisions are then applied to the balance of $2,432, giving a plan reimbursement of $1,786 ((2,432 - 200) times 80%). This produces a post-65 reimbursement ratio of 0.3987 for this claim range. As with the pre-65 case the ratios for all ranges are then averaged using weights given by the distribution table to determine the gross post-65 BLI.

The gross BLIs are then adjusted to reflect participant contributions. Our example here might produce gross BLIs of 0.85 pre-65 and 0.32 post-65. The participant contribution of $10 per month translates into a reduction in the gross BLIs of 0.03 pre-65 and 0.04 post-65, giving final BLIs of 0.82 and 0.28 respectively.

NYASZ #157

Appendix C

Part I: Derivation of the Model

I. Households

All households are assumed to be identical and obtain utility from money and leisure as well as each of the m produced goods. Each household solves the following maximization problem

$$(A1) \quad U^* = \max_{(C_i,M,N)} \{C^{\gamma}(M/P)^{1-\gamma} - (\phi N^{\eta+1})^{1/\eta}\}$$

subject to the constraint that

$$(A2) \quad M + \Sigma_i P_i C_i = I$$

where

$$(A3) \quad C = (\Sigma_i \alpha_i C_i^{(\theta-1)/\theta})^{\theta/(\theta-1)}$$

$$(A4) \quad P = (\Sigma_i \alpha_i^{\theta} P_i^{1-\theta})^{1/(1-\theta)}$$

and C_i is the consumption of produced good i, P_i is the nominal price of produced good i, M is the amount of money held at the end of the period, N is the amount of labor supplied, I is the total nominal value of resources available to the household, C is the bundle of consumption goods defined by the aggregator function in (A3), and P is a price index defined in (A4). (Note that the price index P in (A4) is not the fixed-weight GNP price index. The solution of the model produces prices for each of the m goods which can then be combined to calculate the appropriate fixed-weight GNP price index.) The parameters of the utility function are γ, which equals the share of the household's nominal expenditure on produced goods rather than on money balances; θ, which is the elasticity of substitution between the consumption of any pair of goods; α_i, i = 1,...,m, which indicate the weight of each good in the household's utility function; η, which is the elasticity of labor supply; and ϕ which characterizes the degree of disutility of labor.

The utility function in equation (A1) is additively separable between (C_i,M) and N. This separability allows us to solve the household's maximization problem in two stages. First, we will maximize utility with respect to C_i and M, and then we will choose the utility-maximizing level of labor supply N. Choosing C_i and M to maximize the utility function in (A1) subject to the constraint in (A2) yields the following first-order conditions:

$$(A5) \quad \alpha_i C_i^{-1/\theta} \gamma C^{\gamma-1+1/\theta} (M/P)^{1-\gamma} = \mu P_i$$

$$(A6) \quad (1-\gamma) C^{\gamma} (M/P)^{-\gamma}/P = \mu$$

where μ is the Lagrange multiplier on the constraint (A2).

Combining the first-order conditions (A5) and (A6) yields

(A7) $\alpha_i C_i^{-1/\theta} \gamma C^{(1-\theta)/\theta} M = (1-\gamma) P_i$

Multiplying both sides of (A7) by C_i and then summing over all i yields

(A8) $\Sigma_i \; P_i C_i = (\gamma/(1-\gamma))\; M$

Substituting (A8) into (A2) yields

(A9) $M = (1-\gamma) I$

Substituting (A9) into (A7), summing over all i, and using the definition of the price index in (A4) yields

(A10) $PC = \gamma I$

Substituting (A9) into (A7) and then using (A10) yields the demand for good i

(A11) $C_i = \alpha_i^{\theta} (P_i/P)^{-\theta} \gamma I/P$

Substituting (A9) into (A11) yields

(A12) $C_i = \alpha_i^{\theta} (P_i/P)^{-\theta} (\gamma/(1-\gamma)) M/P$

Having solved for the optimal values of C_i and M, we now solve for the optimal value of labor supply N. First, substitute the optimal values of C_i (eq. A11) and M (eq. A9) into the utility function in (A1) to obtain

(A13) $U^* = \max_N \; (\gamma^{\gamma}(1-\gamma)^{1-\gamma}(I/P) - (\phi N^{\eta+1})^{1/\eta})$

subject to $I = wN + rK^* + M + \pi$, where π is the (present value of) post-retirement health benefits to be received by the household.

The first-order condition for labor supply N is

(A14) $\gamma^{\gamma}(1-\gamma)^{1-\gamma}(w/P) = ((\eta+1)/\eta)(\phi N)^{1/\eta}$

which can be solved to obtain N*, the optimal amount of labor supplied

(A15) $N^* = \nu(w/P)^{\eta}$

where $\nu = [\gamma^{\gamma}(1-\gamma)^{1-\gamma}\eta/(\eta+1)]^{\eta}\phi^{-1}$

II. Firms

Each of the m goods is produced by competitive firms with Cobb-Douglas production functions. The total production of good i, Y_i, is given by the production function

(A16) $Y_i = A_i N_i^{\rho_i} K_i^{1-\rho_i}$ $\quad i = 1,\ldots,m$

The firms are assumed to be competitive and thus take the nominal price of their output, P_i, the nominal rental price of capital, r, and the nominal price of labor, $D_i w$, as fixed. Note that the nominal price of labor consists of two parts: w reflects the nominal wage rate excluding the cost of post-retirement health benefits covered by FAS 106. The factor D_i reflects the impact on the cost per unit of labor of post-retirement health benefits covered by FAS 106. For firms that do not offer post-retirement health benefits, $D_i = 1$. For firms that offer such benefits, $D_i > 1$. Competitive firms choose N_i and K_i to maximize

(A17) $P_i A_i N_i^{\rho_i} K_i^{1-\rho_i} - wD_i N_i - rK_i$ $\quad i = 1,\ldots,m$

The first-order conditions for labor and capital are

(A18) $\rho_i P_i Y_i / N_i = wD_i$ $\quad i = 1,\ldots,m$

(A19) $(1-\rho_i) P_i Y_i / K_i = r$ $\quad i = 1,\ldots,m$

Given the nominal wage w and the FAS 106 factor D_i, (A18) determines the amount of labor demanded in sector i; given the rental price of capital, (A19) determines the amount of capital demanded in sector i.

III. Market Equilibrium

Equilibrium in the factor markets requires that the aggregate amount of labor demanded equal the supply of labor and the aggregate amount of capital demanded equal the supply of capital:

(A20) $\Sigma_i N_i = N^*$

(A21) $\Sigma_i K_i = K^*$

The amount of money demanded equals the amount initially held by consumers

(A22) $M = M^*$

The amount of good i produced must equal the amount of good i demanded, so that using (A12) we obtain

(A23) $Y_i = \alpha_i^{\theta} (P_i/P)^{-\theta} (\gamma/(1-\gamma)) M/P$

The nominal value of production must equal the nominal value of total factor payments, including the (present value of the) cost of post-retirement health benefits,

(A24) $\Sigma_i P_i Y_i = rK^* + w\Sigma_i D_i N_i$

The nominal value of total resources available to the household, I, equals the initial holding of money M^* plus capital income rK^*, wage income, $w\Sigma_i N_i$, and the present value of post retirement health benefits $\pi = w\Sigma_i (D_i - 1)N_i$ so that

(A25) $I = M^* + rK^* + w\Sigma_i D_i N_i$

The solution to the model consists of the equilibrium conditions (A20) - (A25), the production functions (A16), the labor demand equations (A18), the capital demand equations (A19), and the definition of the price index (A4).

Part II: Calibration of the model

The model is calibrated so that in the absence of FAS 106 it yields an allocation of labor across sectors that matches the actual allocation of labor across sectors. It is also calibrated such that in the absence of FAS 106, all nominal prices are equal to one.

Inputs to the calibration procedure:

η, the elasticity of labor supply

θ, the elasticity of substitution between the consumption of any two goods

γ, the share of nominal expenditure devoted to produced goods

N_o^*, the initial total amount of labor to be allocated across sectors

K*, the fixed total amount of capital to be allocated across sectors

ρ_i, the share of labor in total cost in sector i

D_i, the FAS 106 cost factor in sector i (equal to 1 in the absence of FAS 106)

$s^N_i = N_i/N^*$, the fraction of labor employed in sector i

In the initial calibration, all nominal prices are set equal to one

(B1) $P_i = 1, \qquad i = 1,\ldots,m$

(B2) $P = 1$

The amount of labor initially used in each sector follows directly from the fraction of the labor force employed in sector i, s^N_i, and the total amount of labor employed, N_o^*

(B3) $N_i = s^N_i \, N_o^* \qquad i = 1,\ldots,m$

Define $s^Y_i = P_iY_i/\Sigma_iP_iY_i$ to be the share of sector i's output P_iY_i in total output $\Sigma_iP_iY_i$. Then using the labor demand equation (A18) and the fact that the total amount of labor employed is N_o^*, it can be shown that

(B4) $s^Y_i = (D_is^N_i/\rho_i)/\Sigma_i(D_is^N_i/\rho_i) \qquad i = 1,\ldots,m$

Using the capital demand equation (A19) and the fact that the total amount of capital used is K^*, it can be shown that

(B5) $K_i = [(1-\rho_i)s^Y_i/\Sigma_i(1-\rho_i)s^Y_i] \, K^* \qquad i = 1,\ldots,m$

Normalize $A_1 = 1$ so that the production function in the first sector is